Template for Development of Facility – Specific Fish Health Management Plans

British Columbia

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1 INTRODUCTION 4
1.1 Objective 4
1.2 Definitions 4
1.3 Target audience 5
1.4 Document structure 5
1.5 Annual review 5
1.6 Living document 5
1.7 Personnel duties and responsibilities 5
1.8 Communication to Enhance disease Prevention and Control 6
2 NET PEN SITES - SALTWATER (MARINE) SITES, LAKE SITES AND LENS SITES 7
2.1 Biosecurity 7
2.2 Keeping Fish Healthy 8
2.3 Proper Fish Handling techniques 10
2.4 Monitoring water quality 11
2.5 Keeping Pathogens Out 12
2.6 Minimizing disease within the site 14
2.7 Monitoring Fish Health 15
2.8 Fish Health Records 17
2.9 Fish Health Outbreaks 18
2.10 Fish escape 20
2.11 Releases 21
2.12 Handling drugs and chemicals properly 22
3 HATCHERY SITES 25
3.1 Biosecurity 25
3.2 Keeping Fish Healthy 26
3.3 Proper Fish Handling techniques 28
3.4 Monitoring water quality 28
3.5 Keeping Pathogens Out 29
3.6 Minimizing disease within the site 31
3.7 Monitoring Fish Health 32
3.8 Fish Health Records 35
3.9 Fish Health Outbreaks 36
3.10 Fish escape 39
3.11 Releases 40
3.12 Handling drugs and chemicals properly 41
4 BROODSTOCK – SPECIAL CONSIDERATIONS 44
4.1 Suitable rearing environment 44
4.2 Feed and Nutrition 44
4.3 Biosecurity 44
4.4 Selection and handling 45
4.5 Treatments 45
4.6 Egg take 46
4.7 Disease screening 46
4.8 Egg disinfection 46

4.9 Egg (and/or milt) transport 46
4.10 Identifying progeny 47
4.11 Records 47
5 APPENDICES 48
5.1 APPENDIX 1: List of Standard Operating Procedures (SOP's) for Fish Health Management Plan 49
5.2 APPENDIX 2: Elements of a Standard Operating Procedure (SOP) 51
5.3 APPENDIX 3: Regulations/Policies Directly Related to Fish Health Management 52

1 INTRODUCTION

1.1 Objective

The objective of this Fish Health Management Plan is to provide good health conditions for cultured fish owned by operators in British Columbia. All private operators and public fish culture facilities must develop and maintain an up-to-date Fish Health Management Plan (FHMP) specific to their facility (ies). The FHMP is enforced as a condition of an aquaculture license.

This document does not replace the regulatory requirements for a Fish Health Management Plan but is intended to help operators write their own Fish Health Management Plans. Applicable legislation and regulations are included in Appendix 3.

1.2 Definitions

Terms used in this document are defined in BC MAFF's "Fish Health Management Plan: Required Elements". In addition, this document includes the following definition:

Best Management Practices (BMP) must:

- include a description of specific management practices and standard operating procedures
- be reviewed and endorsed by the holder, and
- have the individuals responsible for implementation of the plan understand and be trained in the plan.

1.11 Objective

The objective of a Fish Health Management Plan is to provide good health conditions for cultured fish owned by operators in British Columbia. All operators of fish culture facilities must develop and maintain an up-to-date Fish Health Management Plan (FHMP) specific to their facility (ies). The FHMP is enforced as a condition of an aquaculture license.

The purpose of this document is to assist operators in writing facility specific Fish Health Management Plans. This document does not replace any regulatory requirements not included in a Fish Health Management Plan. Applicable legislation and regulations are included in Appendix 2.

1.3 Target audience

This document is intended as a template from which each operator can build a Fish Health Management Plan for use by each operator's site staff in training and day-to-day contact with the fish, for fish health staff who are responsible for keeping good health status of the fish, and for management who have to make decisions about fish health.

1.4 Document structure

This document is generic and includes sections for Net Pen sites (Marine, Lakes and Lenses), Broodstock and Freshwater /Hatchery sites. Sections requiring an operator-specific Standard Operating Procedure (SOP) are noted in the document.

In development of Fish Health Management plans, operators should have Standard Operating Procedures (SOP's) referencing Appendix 1 and Appendix 2 of this document. In some instances an SOP may apply to more than one section; in these cases the same SOP can be used to address multiple requirements (e.g., the same feed storage SOP may be used for saltwater marine and freshwater hatchery sites if applicable). Operators may also combine related SOP's, e.g. Isolation/Quarantine and Infectious Disease Emergency procedures.

1.5 Annual review

This document will be subject to annual review by the operator's veterinarian and/or fish health staff to make sure they are up to date.

Where Fish Health Management plans are a condition of license, operators can anticipate periodic review by regulators.

1.6 Living document

Changes will be made to this document as required.

1.7 Personnel duties and responsibilities

1.7.1 Veterinarian

The operator's (contract) Veterinarian, in conjunction with fish health staff, is responsible for overall fish health management for the operator. The Veterinarian is licensed in BC and retains a Veterinarian-client-patient relationship with the operator. The Veterinarian is responsible for disease diagnoses and writing prescriptions and he/she is expected to exercise good professional judgment in fish health matters.

The operator will report outbreaks of significant disease to the proper authorities.

1.7.2 Fish Health Manager/Technicians

Job descriptions for Fish Health Manager, Fish Health Technicians, Fish Health Biologist and other positions are detailed by the operator elsewhere.

Fish Health Management refers to those personnel including the Veterinarian who have responsibility for major fish health decisions. Fish Health Management is responsible for identifying and managing risk factors so as to minimize their effect on fish health.

1.7.3 On Site Staff

Farm site staff may be assigned fish health duties from time to time. Site staff are expected to follow good hygienic measures and fish health procedures.

1.7.4 Contact names and numbers

Contact names and numbers for all key fish health personnel, including emergency numbers, will be posted in an easily identifiable location at each site.

1.8 Communication to enhance disease prevention and control

Over and above regulatory reporting requirements to government, aquaculture companies will communicate incidents of disease that are significant[1] to their industry associations, e.g., the BC Salmon Farmers Association (BCSFA) so that clinically unaffected sites in the geographic vicinity can be alerted to the concern. Operators are also encouraged to contact each other directly and/or through the industry-government Fish Health Advisory Committee.

[1] Refer to Canadian Fish Health Protection Regulations and OIE Lists A and B for reportable diseases

2 NET PEN SITES - SALTWATER (MARINE) SITES, LAKE SITES AND LENS SITES

2.1 Biosecurity

Maintaining a clean, safe work environment will reduce the possibility for spread and exposure of fish to infectious or parasitic disease. Pathogens may be spread by sick fish and wild fish through the water, on shared equipment, or by inadvertent contact by personnel, visitors or their gear. Entrance of potential pathogens will be prevented or minimized by an effective biosecurity "barrier" at each facility. Biosecurity applies to all personnel (staff, divers, management), to all visitors and all equipment.

Biosecurity includes three components:

- Keeping fish healthy
- Keeping pathogens out
- Keeping disease from spreading within the site

2.2 Keeping Fish Healthy

Keeping fish as healthy as possible is critical to keeping disease from coming on site and/or spreading within a site.

2.2.1 Single year class sites

Where possible sites will contain single year classes of stock to prevent transmission of disease between year classes.

2.2.2 Suitable rearing environment

The operator's management is responsible for ensuring a suitable rearing environment for the fish, so they can stay healthy. Facility requirements including nets are detailed in regulation.

2.2.3 Normal fish behavior

Fish will be routinely monitored for signs of health and disease. All staff should be familiar with normal fish behaviour. Key behaviours that indicate healthy fish include but are not limited to:

- Physical – changes from normal i.e. scale loss, parasites, external injury
- Behavioral - swimming and schooling behavior, increased respiration
- Feeding – normally aggressive feed response when feed is presented

Fish will be kept at reasonable densities. Changes in behaviour and physical condition will be reported to site management. Early detection is key to good disease management.

2.2.4 Predators

Predators will be excluded from the site. Predators include birds, other fish and marine mammals. The operator maintains Best Management Practices (BMP's) for predator exclusion.

Standard Operating Procedures (SOP's)[2]

Predator exclusion
1. *For private aquaculture facilities Best Management Practices requirements are covered under the BC Escape Management Plan*
2. *For public agencies' facilities an SOP is required.*

2.2.5 Feed and Nutrition

The objective of good nutrition is to keep fish healthy. The operator has procedures in place for healthy feeding of fish, including type of feed and different feed delivery methods. Proper storage of these diets is essential to maintaining their nutritional value.

[2] See Appendix 1 – List of Standard Operating Procedures (SOP's) for a Fish Health Management Plan

Feed will be stored in secure buildings where wildlife can be excluded and spillage prevented.

SOP's

Feed storage

2.3 Proper Fish Handling techniques

2.3.1 Common Fish Handling Techniques

The operator will maintain BMP's for handling fish (e.g. grading or seining, including minimizing the risk of escape while the fish are being handled). Handling - including equipment maintenance - will be done so as to minimize injury to the fish and/or predispose to disease. Fish will be monitored while being handled as well as for a period after handling to ensure any negative effects are noted and mitigative steps are taken to minimize impact. Staff will minimize the time fish are exposed to stressful events such as crowding and out-of-water events (i.e. handling, counting, grading, tagging, injecting).

SOP's

Fish Handling techniques

2.3.2 Harvesting[3]

Fish being moved via live haul to a processing plant will be handled in as stress free a manner as possible. Where fish are stunned and bled on site, they will be brailed and/or seined, pumped and stunned in as stress free a manner as possible. All bloodwater shall be managed as per BMP's (under development). Special SOP's may be required for specific diseases of concern, for example, IHNV (see 2.9.3 (below)).

[3] Not applicable to enhancement/conservation facilities

2.4 Monitoring water quality

Maintaining good water quality is vital to good fish health. The operator maintains a regular program for monitoring and recording water quality at net pen sites. Monitoring will vary between sites depending on location and specifics of the aquatic environment.

SOP's

Water quality monitoring -e.g., temperature, dissolved oxygen, plankton
Water quality equipment calibration and maintenance

2.4.1 Contingency planning

The operator maintains a contingency plan in the event of acute deterioration of water quality. Depending on cause, fish will usually be taken off feed immediately. Water quality monitoring is immediately increased to determine the cause and to estimate how long the problem may persist. Fish will be monitored more closely for the duration of the event and will not be further handled until water quality is acceptable. Records will be kept.

Enhancement fish being transiently held in marine net pens will be released as per DFO's Priority Release Plan (to follow).

Attachment

Operator's Water Quality Contingency Plan (marine sites)
DFO Business Resumption Plan

2.5 Keeping Pathogens Out

All necessary precautions will be taken to ensure disease is kept out of a facility.

2.5.1 Personnel movement

Staff will adhere to biosecurity procedures for the site. Where possible, personnel will not travel between sites. If such travel is unavoidable, personnel will adhere to all biosecurity procedures at each facility.

SOP's

Site and staff disinfection and biosecurity procedures

2.5.2 Visitors

Each site shall have procedures for all visitors, and visitors are expected to follow these procedures.

SOP's

Visitor procedures

2.5.3 Equipment

Equipment will be kept clean at all times. This is to prevent possible spread of pathogens by fish, personnel or water borne route. Equipment will be properly disinfected after each use and put away in its proper place.

2.5.4 Equipment movement

Where possible, equipment will not be shared between sites. This includes fish handling equipment, vessels, feeding, monitoring and other equipment. Vessels and equipment, which must be used at multiple sites, will be subject to strict biosecurity and disinfection measures between uses.

SOP's

Equipment disinfection

2.5.5 Diver disinfection and movement

Divers will adhere to disinfection and biosecurity procedures at each facility. All efforts will be made for additional disinfection of divers, equipment and vessels to occur in transit between sites.

SOP's

Diver disinfection per site
Diver procedures if diving multiple sites

2.5.6 Suppliers

Suppliers will be advised of operator and site procedures in advance. Suppliers who visit multiple sites shall be subject to strict biosecurity measures and may be requested not to come on site. Farms will notify suppliers of any significant disease concerns, as per 2.9.2.4 (below).

SOP's

Supplier procedures (general)

2.5.7 Moving fish between sites

Fish movement between sites will be minimized, however, when this is necessary permits will be obtained and a disease risk assessment done by Fish Health Management prior to moving the fish. If there is a disease of concern, fish cannot be moved without Introduction and Transfers Committee approval. Particular care will be paid to handling of the fish to avoid undue stress, transmission of disease or possibility of escape. Where there is a potential fish health problem the risk will be assessed in by a fish health professional in advance of the fish being moved. Where well boats are used, water quality will be closely monitored and maintained to reduce stress during transport.

SOP's

Fish transport procedure

2.6 Minimizing disease within the site

All efforts will be made to minimize disease on a site. Adequate hygiene, disinfection, and mortality collection help to keep fish healthy and exposed to as few pathogens as possible.

2.6.1 Hygiene and disinfection - personnel

All personnel will adhere to the facility hygiene and disinfection procedures as per 2.5.1 (above).

2.6.2 Hygiene and disinfection – equipment

Equipment must be kept clean, in good working order and disinfected as per 2.5.4 (above).

2.6.3 Mort collection

Mortalities will be collected on a routine and frequent basis to minimize the potential spread of disease and to minimize attractiveness to predators. The operator has BMP's for mortality collection. Disinfection procedures will be adhered to after each mort dive.

Management of unusually high mortalities will be as per 2.9.2.5 (below).

SOP's

Mortality collection and disposal

2.7 Monitoring Fish Health

Fish will be monitored at least once daily for any unusual behaviours, visible lesions or other signs of disease. Changes in behaviour and physical condition will be reported to site management. Water quality will also be routinely monitored (as per 2.4 (above)).

2.7.1 Mort dives

Morts collected on routine mort dives (as per 2.6.3 (above)) will be examined for signs of disease. Suspected causes of mortality must be recorded and Fish Health Management will be notified of any unusual numbers or types of mortalities.

Routine sampling may be done as per the operator's procedures and/or on the instructions of the operator Veterinarian and/or Fish Health Management.

SOP's

Mortality classifications

SOP's

Fish health sampling procedures, e.g., proper collection and shipping of samples, lab work (on-site, in house or referred)

2.7.2 Common fish health procedures

2.7.2.1 Anesthetizing fish

A variety of fish health procedures require that fish be anesthetized. Anesthetics are obtained through the operator's veterinarian. Netting or seining of fish prior to anesthesia will be done in as stress-free a manner as possible. Exposure to anesthetic will be minimized while ensuring the anesthetic level is adequate for the procedure. Anesthetized fish will be monitored carefully at all times. Water quality of the anesthetic bath – in particular, oxygen level – will be monitored.

SOP's

Anesthesia

2.7.2.2 Sea Lice Monitoring[4]

Sea lice levels ("counts") need to be monitored to make effective management and treatment decisions. The BC industry is currently developing procedures for consistent monitoring between operators and sites. When complete these will be added in to this document.

[4] Not applicable to net pen lake sites or lens sites on freshwater

SOP's

Sea Lice Monitoring (in process)

2.7.2.3 Vaccinating fish

Vaccines may be administered at lake and lens sites and occasionally at marine net pen sites. Vaccines are used to boost immunity to certain infectious diseases (e.g. Furunculosis) and are part of an integrated fish health management program. Vaccines are biologic substances that will be stored (refrigerated) and handled as per manufacturer's instructions so as to maintain their effectiveness. Staff will be appropriately trained prior to undertaking the vaccination procedure.

Dip vaccination will be done in accordance with manufacturer's guidelines. Fish will be handled in as stress-free a manner as possible.

Intraperitoneal vaccines will be administered in accordance with manufacturer's guidelines.

SOP's

Vaccine handling and storage
Dip vaccination
Intraperitoneal (IP) vaccination

2.7.2.4 Euthanasia

In the uncommon situation where fish should be euthanised (e.g., certain fish health sampling), euthanasia should be done in as humane a manner as possible. The method used should result in rapid and irreversible loss of consciousness.

SOP's

Euthanasia

2.8 Fish Health Records

Fish health records include but are not limited to:

- Inventory records
    - Includes source, number, location and lot of fish at the site
- Fish movement records
- Mortality records including mortality cause
- Lab work
- Diagnostic sampling records
- Water quality records
- Medicated feed records
- Therapeutant treatment records (see also 2.12 (below))
- Records of mitigative actions (other than therapeutants) taken to prevent or mitigate disease, e.g. taking fish off feed due to a plankton bloom
- Records of reporting to Provincial or Federal authorities, in accordance with existing regulation

Many of these records are computerized and form part of the integrated operator record keeping system. The operator will provide adequate system training and documentation to authorized site personnel including data entry and reports, e.g. ENPRO for DFO and HIMAN for FFSBC. Backups will be maintained.

Paper records not entered into a computerized system will be easily accessible and protected from damage, e.g. kept in binders in the site office.

Records will be kept for the duration of time the fish are on site. The operator will keep archived records at a suitable location in head office or securely stored off site.

Aquaculture facility records will be available for inspection upon request by BC MAFF as per regulation.

Records will be reviewed on a routine basis by the operator's Veterinarian and/or Fish Health Management to look for patterns in fish health and disease.

2.8.1 Reporting to BC Fish Health Database

The operator will report required fish health data, e.g. mortality cause and fish health event information to the BCSFA Fish Health Database on a monthly basis. The Database reports aggregated information quarterly to BCMAFF.

Aquaculture companies will keep records of data submission for audit by BC MAFF.

2.9 Fish Health Outbreaks

A fish health emergency is any situation where the health of a fish population is suddenly at risk. This may be due to significant pathogens such as IHN virus or to water quality changes such as plankton blooms or sudden, severe decreases in dissolved oxygen levels. Vigilant monitoring and early detection is key to good management of emergencies.

SOP's

Fish Health Emergency Procedures

2.9.1 First steps

The operator Veterinarian and/or Fish Health Management will be *immediately* notified if a serious problem is suspected. If the problem is plankton or low dissolved oxygen the site will activate the Operator's Water Quality Contingency Plan (see 2.4.1 (above)).

2.9.2 Infectious Disease Emergencies

An outbreak is defined as an unexpected occurrence of mortality or disease. Not all outbreaks are fish health emergencies. Diseases may differ in how contagious they are and therefore how easy or difficult they are to control. Rapid response is essential but will be determined on a case-by-case basis in conjunction with the Veterinarian and/or Fish Health Management. Once an emergency has been recognized certain steps will be followed. The objective is to keep the pathogen "load" as low as possible and to prevent spread of the problem on or off the site.

2.9.2.1 Isolation/Quarantine[5]

At the Veterinarian's recommendation the site may be officially isolated/quarantined. Isolation/Quarantine remains in effect until such time as the problem has been diagnosed and/or managed.

SOP's

Isolation/Quarantine

2.9.2.2 Stop fish movement and/or handling

The movement of all fish on/off and within the site may cease. Fish will not be further handled. Equipment and personnel will *not* move on or off site unless special arrangements are made, e.g., for staff going on or off shift for the site. No visitors or non-essential staff will be allowed on site unless previously authorized by Management.

2.9.2.3 Disinfection and Hygiene

Hygiene and disinfection on site, including procedure for personnel and equipment will be strictly enforced.

[5] "Quarantine" is the enforced physical separation of a healthy population from a (potentially) infected population, their products or items they may have contaminated (Martin et. al., eds. Veterinary Epidemiology: Principles and Methods)

2.9.2.4 Suppliers

Suppliers (e.g., feed barge, mort pick up) will be instructed to visit the site last or to make special arrangements (e.g., designated vessel) to pick up and deliver only to the affected site.

2.9.2.5 Mortality Dives

The frequency of mortality dives will be increased. The affected site will be dived last and divers will adhere to disinfection procedures between sites. Where possible separate gear and vessel will be designated for the affected site. All equipment, surfaces and clothing that come in contact with infected fish or infected material will be thoroughly disinfected after use. Mortality collection and disposal procedures will be strictly adhered to, and provisions made for increased mortality pick-ups and disposal.

2.9.2.6 Determining the cause of the outbreak (outbreak investigations)

The Veterinarian may require records and appropriate sampling to determine cause of the outbreak and best course of action. The Veterinarian and/or Fish Health Management will give instructions for proper sampling. Water and feed samples may be requested. Samples will be properly handled, properly stored and promptly shipped as per the Veterinarian's or Fish Health Management's instructions.

Continued monitoring will be required after the initial workup to determine the course of the outbreak and to assess whether treatment and/or management measure are being effective. Frequent observations of the fish are essential. Feeding response and water quality will be monitored. All treatments and management changes will be noted as they occur. The Veterinarian, Fish Health Management and site management will work together to review fish health records and make further management decisions. Any repeat sampling – including results - will be duly noted.

2.9.2.7 Site depopulation

If it has been agreed to depopulate the site, the procedures will conducted in a manner consistent with principles of hygiene and biosecurity (see 2.9.3 (below)).

2.9.2.8 Reporting to authorities

Where appropriate and/or in accordance with existent regulation, operator's management will report the outbreak to Provincial or Federal authorities.

2.9.2.9 Communicating with other operators

As per 1.8 (above) the operator's head office will notify other operators in the geographic area of the outbreak.

2.9.3 IHNV (Infectious Hematopoietic Necrosis Virus) in Atlantic salmon

IHNV is a known infectious disease with significant impact on Atlantic salmon. An industry-wide IHNV management plan is under development by BC MAFF and industry.

Current recommendations for management of this disease are on the BCMAFF website: http://www.agf.gov.bc.ca/fisheries/health/IHNV_Isolation_Control_Procedures.pdf

2.10 Fish escape

In the unlikely event that fish escape, the operator's Fish Escape Response Plan goes into immediate effect. As part of the Response Plan, fish health records - including relevant diagnoses and treatments - will be made available to the appropriate regulatory authorities upon request.

2.11 Releases

The health and treatment status of fish will be considered when planning intentional fish releases from enhancement/conservation facilities. If there is a health or treatment concern fish shall not be released until risk assessment recommendations are in place.

SOP's

Risk assessment for fish releases

2.12 Handling drugs and chemicals properly

The goal of good fish health management is to have healthy and productive fish. However if fish do become sick, they may require treatment with a therapeutant. As per 1.7.1 (above) the Veterinarian retains a veterinarian-client-patient relationship with the operator that is the basis for disease diagnoses and prescribing treatments.

2.12.1 Medicated feed storage and inventory

Medicated feed is stored in clearly marked bags separately from non-medicated feed. The storage area should be clean, dry and free of predators. The label on the medicated feedbag states details about the feed, medication included, feed rate, name of the veterinarian, prescription number and date it was milled.

Medicated feed will be inventoried separately from regular feed. Daily inventory records will be kept as the feed is fed to the fish according to prescription.

In the unlikely event there is excess medicated feed after completion of the treatment the manufacturer will be contacted to determine proper handling and disposal.

SOP's

Medicated feed handling and storage

2.12.2 Handling and administering medicated feed

Medication mixed into feed has a Material Safety Data Sheet (MSDS), which specifies handling and safety precautions. An MSDS for all medications used must be on site in a readily accessible binder. As per WHMIS all chemicals must be handled safely by trained staff e.g., by wearing appropriate protective gear and taking suitable precautions.

Medicated feedbags, including bulk bags will be handled carefully in transit from storage to automated feeding equipment or in preparation for hand feeding. All inadvertent spillage will be cleaned up immediately, and feed will be protected from bird predation.

Medicated feed will be fed out in accordance with the Veterinarian's instructions. The appropriate pen(s) must receive the prescribed amount medicated feed for the duration of treatment.

SOP's

Administering medicated feed

2.12.3 Treatment records

Provincial regulations require that treatment records for therapeutants include:

- Aquaculture license number and name of holder
- Location of aquaculture facility

- Species of fin fish
- Name of the prescribing Veterinarian
- A log naming the drugs (therapeutants), including
    - Name of the Drug
    - Specifying how they were administered
    - Treatment schedule including the date treatment commenced
    - Date of last treatment
    - Name and signature of the person responsible for administering each treatment

Detailed records of medicated feed administration will be kept during the entire time of medication. Medicated feed records will be kept for the entire time the fish are on site. In combination with inventory records, the groups that were treated will be readily identifiable through treatment and withdrawal times.

A copy of the treatment records will accompany those fish to another site if the fish are subsequently moved.

2.12.4 Treatment records for harvest

Fish will not be harvested until they have cleared the withdrawal period prescribed by the Veterinarian.

As per Provincial regulations, when fish are delivered to a processing plant a Drug Declaration Form will accompany the fish,[6] including:

- Aquaculture license number
- Species of fish
- Date of harvest
- Name of the processing plant to which finfish are delivered
- Quantity of fish harvested
- Lot number to identify the shipment of fish
- The date of the most recent treatment, if any, with a drug or the final day of the withdrawal period for an administered drug, whichever is latest, including
    - Name of drug
    - Treatment schedule
    - Dates treatment commenced and finished
    - Established withdrawal period
    - Name of the Veterinarian, if any who prescribed the drug and
    - Name of the person responsible for administering the treatment

The processing plant keeps these records for one year.

[6] Form available from BCSFA

2.12.5 Enhanced fish

DFO enhanced fish that have been treated must be disposed of as per the Carcass Disposal Guidelines.

2.12.6 Chemicals and Biologicals

2.12.6.1 Disinfectants

Disinfectants will be stored in clearly marked containers. An MSDS for each disinfectant that is on site will be kept in a safe, readily accessible place, e.g. binder in the site office. As per WHMIS all chemicals must be handled safely by trained staff e.g., by wearing appropriate protective gear and taking suitable precautions.

The BC industry is currently developing Best Management Practices for handling spent disinfectants. When complete these will be added in to this document.

Best Management Practices

Disposal of spent disinfectants (in process)

2.12.6.2 Chemicals

Chemicals include but are not limited to fixatives, such as formalin or Davidson's solution used for preserving fish tissues. These chemicals will be stored in clearly marked containers. An MSDS for each chemical that is on site will be kept in a safe, readily accessible place, e.g. binder in the site office. As per WHMIS all chemicals must be handled safely by trained staff, e.g., by wearing appropriate protective gear and taking suitable precautions.

2.12.6.3 Biologicals

Biologicals include vaccines. Where applicable, these products will be kept refrigerated and handled as per manufacturer's instructions. A product insert for each vaccine that is on site will be kept in a safe, readily accessible place. Trained staff must handle all biologicals safely e.g., by wearing appropriate protective gear and taking suitable precautions.

3 HATCHERY SITES

3.1 Biosecurity

Maintaining a clean, safe work environment will reduce the possibility for spread and exposure of fish to infectious or parasitic disease. Pathogens may be spread by sick fish and wild fish through the water, on shared equipment, or by inadvertent contact by personnel, visitors or their gear. Entrance of potential pathogens will be prevented or minimized by an effective biosecurity "barrier" at each facility. Biosecurity applies to all personnel (staff, divers, management), to all visitors and all equipment.

Biosecurity includes three components:

- Keeping fish healthy
- Keeping pathogens out
- Keeping disease from spreading within the site

3.2 Keeping Fish Healthy

Keeping fish as healthy as possible is critical to keeping disease from coming on site and/or spreading within a site.

3.2.1 Separation of year classes

Hatchery operations have overlapping year classes on site, e.g., early incubation, fry rearing and possibly broodstock. Rearing units will be kept separate to prevent transmission of disease between year classes.

3.2.2 Suitable rearing environment

The operator management is responsible for ensuring a suitable rearing environment for the fish, so they can stay healthy. Facility requirements for physical assets are specified elsewhere. Redundant and/or back up systems are necessary in the event of catastrophic failures in the water supply.

3.2.3 Normal fish behavior

Fish will be routinely monitored for signs of health and disease. All staff should be familiar with normal fish behaviour. Key behaviours that indicate healthy fish include but are not limited to:

- Physical – changes from normal i.e. scale loss, parasites, external injury
- Behavioral - swimming and schooling behavior, increased respiration
- Feeding – normally aggressive feed response when feed is presented

Fish will be kept at reasonable densities. Changes in behaviour and physical condition will be reported to site management. Early detection is key to good disease management.

3.2.4 Predators

Predators will be excluded from the site. Predators include birds, other fish and marine mammals. The operator maintains Best Management Practices (BMP's) for predator exclusion.

Standard Operating Procedures (SOP's)[7]*:*

Predator exclusion
1. *For private aquaculture facilities Best Management Practices requirements are covered under the BC Escape Management Plan*
2. *For public agencies' facilities an SOP is required.*

3.2.5 Feed and Nutrition

The objective of good nutrition is to keep fish healthy. The operator has procedures in place for healthy feeding of fish, including type of feed and different feed delivery

[7] See Appendix 1 – List of Standard Operating Procedures (SOP's) for a Fish Health Management Plan

methods. Proper storage of these diets is essential to maintaining their nutritional value. Feed will be stored in secure buildings where wildlife can be excluded and spillage prevented.

SOP's:

Feed storage

3.3 Proper Fish Handling techniques

3.3.1 Common Fish Handling Techniques

The operator maintains BMP's for handling fish, e.g. grading, including minimizing the risk of escape while the fish are being handled. Handling – including equipment maintenance - will be done so as to minimize injury to the fish and/or predispose to disease. Fish will be monitored while being handled as well as for a period after handling to ensure any negative effects are noted and mitigative steps are taken to minimize impact. Staff will minimize the time fish are exposed to stressful events such as crowding and out-of-water events (i.e. handling, counting, grading, tagging, injecting).

SOP's:

Fish Handling techniques

3.3.2 Marking fish

Marking fish will be done in a manner to cause minimal injury and stress to the fish. The resulting open wound can lead to secondary infections. Appropriate anesthesia (see 3.7.2.4 (below)) and monitoring will be done for adverse effects after the procedure.

SOP's

Marking Fish

3.3.3 Fish transports

Fry, smolts and other life stages will be handled in as stress-free a manner as possible in preparation for transport. Equipment will be checked to prevent significant injury that could predispose fish to disease. Proper hygiene and disinfection will be adhered to. Appropriate permits will be obtained from DFO.

SOP's

Fish transport

3.4 Monitoring water quality

Maintaining good water quality is vital to good fish health. The operator maintains a regular program for monitoring and recording water quality at hatchery sites. Monitoring will vary between sites depending on location and the specifics of the aquatic environment. In-line monitoring may be applicable. The frequency of monitoring will depend on available equipment and type of facility, e.g., flow through or recirculation.

SOP's

Water quality monitoring - temperature, DO, chemistries, (others as applicable)
Water quality equipment calibration and maintenance

3.4.1 Contingency planning

The operator maintains a contingency plan in the event of acute deterioration of water quality. Systems are suitably alarmed to indicate changes in water quality below predetermined set points, e.g. precipitous fall in dissolved oxygen levels.

Failure of pumps and/or oxygen delivery is an immediate emergency. The site has back up system(s) for keeping dissolved oxygen levels compatible with short-term life support for the fish while the system failure is being addressed.

Enhancement/conservation fish will be released as per DFO's Business Resumption Plan (to follow).

Attachment:

Operator's Water Quality Contingency Plan (hatchery) *DFO Business Resumption Plan*

3.5 Keeping Pathogens Out

All necessary precautions will be taken to ensure disease is kept out of a facility. Potential pathogens will be prevented or minimized by an effective biosecurity "barrier" at the perimeter of each facility and, where possible, between rearing units on the facility. Biosecurity applies to all personnel (staff, management), to all visitors and all equipment.

3.5.1 Personnel movement

Staff will adhere to biosecurity procedures for the site. Where possible personnel will not travel between hatcheries. If such travel is unavoidable, personnel will adhere to all biosecurity procedures at each facility.

SOP's

Site and staff disinfection procedures

3.5.2 Visitors

Each site shall have procedures for all visitors, and visitors are expected to follow these procedures.

SOP's

Visitor procedure (generic procedure under development by BCSFA)

3.5.3 Equipment

Equipment will be kept clean at all times. This is to prevent possible spread of pathogens by fish, personnel or water borne route. Equipment will be properly disinfected after each use and put away in its proper place.

3.5.4 Equipment movement

Where possible equipment will not be shared between sites. This includes pumps, vehicles and fish handling equipment. Where this is not possible, equipment that must be used at multiple sites will be subject to strict biosecurity and disinfection measures between uses.

SOP's

Equipment disinfection

3.5.5 Suppliers

Suppliers will be advised of operator and site procedures in advance. Suppliers who visit multiple sites shall be subject to strict biosecurity measures and may be requested not to come on site. Particular attention will be paid to biosecurity measures for mort pick-ups. Farms will notify suppliers of any significant disease concerns, as per 3.9.2.4 (below).

SOP's

Mort pick-ups (see 3.6.3 (below)) *Supplier procedures (general)*

3.5.6 Moving fish between sites

Fish movement between sites will be minimized, however wherever this is necessary permits will be obtained and a disease risk assessment done by a fish health professional prior to moving the fish. If there is a disease of concern fish cannot be moved without Introduction and Transplant Committee approval. Particular care will be paid to handling of the fish to avoid undue stress, transmission of disease or possibility of escape. Where there is a potential fish health problem the risk will be reduced in conjunction with a Fish Health Management advance of the fish being moved.

The move will be planned in advance to be as stress-free and short as possible. The receiving sites will make arrangements for isolating the newly arriving fish. Water quality will be maintained and frequently monitored during transport. All attempts will be made to minimize the amount of transport water delivered to the receiving site, to prevent spread of waterborne pathogens.

SOP's

Moving fish between sites

3.6 Minimizing disease within the site

All efforts will be made to minimize disease on a site. Adequate hygiene, disinfection, mortality collection and tank cleaning help to keep fish healthy and exposed to as few pathogens as possible.

3.6.1 Hygiene and disinfection - personnel

All personnel will adhere to the facility hygiene and disinfection procedures as per 3.5.1, (above).

3.6.2 Hygiene and disinfection – equipment

Equipment must be kept clean, in good working order and disinfected as per 3.5.4 (above).

3.6.3 Mort collection

Mortalities will be collected on a routine and frequent basis to minimize the potential spread of disease and to minimize attractiveness to predators. The operator has BMP's for mortality collection. The mort storage area will be an appropriate distance away from any rearing units to minimize inadvertent spread of disease. Proper disinfection procedures will be adhered to after each mort collection.

Management of unusually high mortalities will be as per 3.9.2.5 (below).

SOP's

Mortality collection and disposal

3.7 Monitoring Fish Health

Fish will be monitored at least once daily for any unusual behaviours, visible lesions or other signs of disease. Changes in behaviour and physical condition will be reported to site management. Water quality will also be routinely monitored (as per 4.4 (above)).

3.7.1 Mortality classification

Morts collected daily (as per 3.6.3 (above)) will be examined for signs of disease. As per the operator procedure suspect morts may be examined internally. Suspected causes of mortality must be recorded and fish health management will be notified of any unusual numbers or types of mortalities.

Routine sampling may be done as per the operator procedure and/or on the instructions of the operator's Veterinarian and/or Fish Health Management.

SOP's

Mortality classifications

SOP's

Fish health sampling procedures e.g., proper collection and shipping of samples, lab work (on-site, in house or referred)

3.7.2 Common fish health procedures

3.7.2.1 Egg disinfection

Eggs can be safely disinfected following fertilization and water hardening. This is done at the broodstock facility and/or when the eggs enter the hatchery.

SOP's

Egg disinfection

3.7.2.2 Egg treatments

Developing eggs are sensitive to light, shock and fungal infections. Eggs will be periodically checked for mortality, and presence of infectious diseases or fungus. Affected eggs will be treated as necessary.

SOP's

Egg treatment

3.7.2.3 Alevin treatments

Hormones are not used in farmed fish grown for food in British Columbia. There is an approved process in place to use small amounts of the male hormone - testosterone - to start the generation of all-female breeding lines of salmon. Hormone access and use is regulated and controlled by both the federal and provincial governments and available

only through veterinary prescription. Records of the amount of hormone used and details about the fish treated are submitted to the Ministry of Agriculture, Fisheries and Food. Proper methods for disposal of the bath solution mentioned above must be followed. Any portion of the product not used must be returned to the Ministry.

All facilities producing breeding stock in the above manner are inspected by the Ministry's Fish Health Veterinarian and /or designated staff. The treated fish must be kept separate from all other stocks and marked for easy identification. Records of all use must be provided to the Ministry each year. Private veterinarians in cooperation with the Ministry of Agriculture, Fisheries and Food also provide information and guidance to farmers on the safe handling and use of these products.

SOP's

Alevin treatments

3.7.2.4 Anesthetizing fish

A variety of fish health procedures require that fish be anesthetized. Anesthetics will be obtained from the operator's veterinarian. Netting of fish prior to anesthesia will be done in as stress-free a manner as possible. Exposure to anesthetic will be minimized while ensuring the anesthetic level is adequate for the procedure. Anesthetized fish will be monitored carefully at all times. Water quality of the anesthetic bath – in particular, oxygen level – will be monitored.

SOP's

Anesthesia

3.7.2.5 Vaccinating fish

Vaccines are used to boost immunity to certain infectious diseases (e.g. Furunculosis) and are part of an integrated fish health management program. Vaccines are biologic substances that will be stored (refrigerated) and handled as per manufacturer's instructions so as to maintain their effectiveness. Staff will be appropriately trained prior to undertaking the vaccination procedure.

Dip vaccination will be done in accordance with manufacturer's guidelines. Fish will be handled in as stress-free a manner as possible.

Intraperitoneal vaccines will be administered in accordance with manufacturer's guidelines.

SOP's

Vaccine handling and storage
Dip vaccination
Intraperitoneal (IP) vaccination

3.7.2.6 Euthanasia

In the uncommon situation where fish should be euthanised (e.g., certain fish health sampling), euthanasia should be done in as humane a manner as possible. The method used should result in rapid and irreversible loss of consciousness.

SOP's

Euthanasia

3.8 Fish Health Records

Fish health records include but are not limited to:

- Inventory records
    - Includes source, number, location and lot of fish at the site
- Fish movement records
- Mortality records including mortality cause
- Lab work
- Diagnostic sampling records
- Water quality records
- Medicated feed records
- Therapeutant treatment records (see also 3.12, below)
- Records of mitigative actions (other than therapeutants) taken to prevent or mitigate disease, e.g. refused shipment of potentially infected eggs
- Records of reporting to Provincial or Federal authorities, in accordance with existing regulation

Many of these records are computerized and form part of the integrated operator record keeping system. The operator will provide adequate system training and documentation to authorized site personnel including data entry and reports, e.g. ENPRO for DFO and HIMAN for FFSBC. Backups will be maintained.

Paper records not entered into a computerized system will be easily accessible and protected from damage, e.g. kept in binders in the site office.

Records will be kept for the duration of time the fish are on site. The operator will keep archived records at a suitable location in head office or securely stored off site.

Aquaculture facility records will be available for inspection upon request by BC MAFF as per regulation.

Records will be reviewed on a routine basis by the operator's Veterinarian and/or Fish Health Management to look for patterns in fish health and disease.

3.8.1 Reporting to BC Fish Health Database

The operator will report required fish health data, e.g. mortality cause and fish health event information to the BCSFA Fish Health Database on a monthly basis. The Database reports aggregated information quarterly to BCMAFF.

Aquaculture companies will keep records of data submission for audit by BC MAFF.

3.9 Fish Health Outbreaks

A fish health emergency is any situation where the health of the fish population is suddenly at risk. This may be due to significant pathogens such as IHN virus or sudden, severe decreases in dissolved oxygen levels. Vigilant monitoring and early detection is key to good management of emergencies.

SOP's

Fish Health Emergency Procedures

3.9.1 First steps

If there is a system failure all efforts will be directed to restoring sufficient water quality for the fish. Sufficient oxygen levels must be restored to support the fish. The site will immediately activate the Operator's Water Quality Contingency Plan (see 3.4.1(above)).

If a serious infectious disease problem is suspected the operator's Veterinarian and/or Fish Health Management will be *immediately* notified. If the problem is not easily discerned, diagnosis and management need to be done hand in hand.

3.9.2 Infectious Disease Emergencies

An outbreak is defined as an unexpected occurrence of mortality or disease. Not all outbreaks are fish health emergencies. Diseases may differ in how infectious they are and therefore how easy or difficult they are to control. Rapid response is essential but will be determined on a case-by-case basis in conjunction with the Veterinarian and/or Fish Health Management. Once an emergency has been recognized certain steps will be followed. The objective is to keep the pathogen "load" as low as possible and to prevent spread of the problem on or off the site.

3.9.2.1 Isolation/Quarantine[8]

At the Veterinarian's recommendation the site may be officially isolated/quarantined. Isolation/Quarantine remains in effect until such time as the problem has been diagnosed and/or managed.

SOP's

SOP's Isolation/Quarantine

3.9.2.2 Stop fish movement and/or handling

The movement of all fish on/off and within the site may cease. Fish will not be further handled. No visitors or non-essential staff will be allowed on site unless previously authorized by Management.

[8] "Quarantine" is the enforced physical separation of a healthy population from a (potentially) infected population, their products or items they may have contaminated (Martin et. al., eds. Veterinary Epidemiology: Principles and Methods)

3.9.2.3 Disinfection and Hygiene

Hygiene and disinfection on site, including procedure for personnel and equipment will be strictly enforced.

3.9.2.4 Suppliers

Suppliers (e.g., feed or oxygen delivery) will be instructed to visit the site last or to make special arrangements.

3.9.2.5 Mortality Collection

The frequency of mortality collection will be increased. Affected tanks will be mort picked last and staff will adhere to disinfection procedures between tanks and rearing units. Where possible separate gear will be designated for the affected unit. All equipment, surfaces and clothing that come in contact with infected fish or infected material will be thoroughly disinfected after use. Mortality collection and disposal procedures will be strictly adhered to, and provisions made for increased mortality pick-ups and disposal.

3.9.2.6 Determining the cause of the outbreak (outbreak investigations)

The Veterinarian may require records and appropriate sampling to determine cause of the outbreak and best course of action. The Veterinarian and/or Fish Health Management will give instructions for proper sampling. Water and feed samples may be requested. Samples will be properly handled, properly stored and promptly shipped as per the Veterinarian's or Fish Health Management's instructions.

Continued monitoring will be required after the initial workup to determine the course of the outbreak and to assess whether treatment and/or management measure are being effective. Frequent observations of the fish are essential. Feeding response and water quality should be monitored. All treatments and management changes should be noted as they occur. The Veterinarian, Fish Health Management and site management will work together to review fish health records and make further management decisions. Any repeat sampling – including results - should be duly noted.

3.9.2.7 Site depopulation

If it has been agreed to depopulate the site, the procedures will conducted in a manner consistent with principles of hygiene and biosecurity (see 3.9.3 (below)).

3.9.2.8 Reporting to authorities

Where appropriate and/or in accordance with existent regulation, operator management will report the outbreak to Provincial or Federal authorities.

3.9.2.9 Communicating with other operators

As per 1.8 (above) the operator's head office will notify other operators in the geographic area of the outbreak.

3.9.3 IHNV (Infectious Hematopoietic Necrosis Virus) in Atlantic salmon

IHNV is a known infectious disease with significant impact on Atlantic salmon. This disease has not yet been documented in farmed salmon hatcheries. However, an industry-wide IHNV management plan is under development by BC MAFF and industry.

Current recommendations for management of this disease are on the BCMAFF website: http://www.agf.gov.bc.ca/fisheries/health/IHNV_Isolation_Control_Procedures.pdf.

3.10 Fish escape

In the unlikely event that fish escape into nearby streams or watersheds, the operator Fish Escape Response Plan goes into immediate effect. As part of the Response Plan, fish health records - including relevant diagnoses and treatments - will be made available to the appropriate regulatory authorities as required.

3.11 Releases

The health and treatment status of fish will be considered when planning intentional fish releases from enhancement/conservation facilities. If there is a health or treatment concern fish shall not be released until risk assessment recommendations are in place.

SOP's

Risk assessment for fish releases

3.12 Handling drugs and chemicals properly

The goal of good fish health management is to have healthy and productive fish. However if fish do become sick, they may require treatment with a therapeutant. As per 1.7.1 (above) the Veterinarian retains a veterinarian-client-patient relationship with the operator that is the basis for disease diagnoses and prescribing treatments.

3.12.1 Medicated feed storage and inventory

Medicated feed will be stored in clearly marked bags separately from non-medicated feed. The storage area should be clean, dry and free of predators. The label on the medicated feedbag states details about the feed, medication included, feed rate, name of the veterinarian, prescription number and date it was milled.

Medicated feed will be inventoried separately from regular feed. Daily inventory records will be kept as the feed is fed to the fish according to prescription.

In the unlikely event there is excess medicated feed after completion of the treatment the Veterinarian will be contacted to determine proper handling and disposal.

SOP's

Medicated feed handling and storage

3.12.2 Handling and administering medicated feed

Medication mixed into feed has a Material Safety Data Sheet (MSDS), which specifies handling and safety precautions. An MSDS for all medications used on site must be on site in a readily accessible binder. As per WHMIS all chemicals must be handled safely by trained staff e.g., by wearing appropriate protective gear and taking suitable precautions.

Medicated feed will be fed out in accordance with the Veterinarian's instructions. The appropriate tank(s) must receive the prescribed amount medicated feed for the duration of treatment.

SOP's

Administering medicated feed

3.12.3 Treatment records

Provincial regulations require that treatment records for therapeutants include:

- Aquaculture license number and name of holder
- Location of aquaculture facility
- Species of fin fish
- Name of the prescribing Veterinarian
- A log naming the drugs (therapeutants), including

- Name of the Drug
- Specifying how they were administered
- Treatment schedule including the date treatment commenced
- Date of last treatment
- Name and signature of the person responsible for administering each treatment

Detailed records of medicated feed administration will be kept during the entire time of medication. Medicated feed records will be kept for the entire time the fish are on site. In combination with inventory records, the groups that were treated will be readily identifiable through treatment and withdrawal times.

A copy of the treatment records will accompany those fish to another site if the fish are subsequently moved.

3.12.4 Enhanced fish

DFO enhanced fish that have been treated must be disposed of as per the Carcass Disposal Guidelines.

3.12.5 Chemicals and Biologicals

3.12.5.1 Disinfectants

Disinfectants will be stored in clearly marked containers. An MSDS for each disinfectant that is on site will be kept in a safe, readily accessible place, e.g., binder in the site office. As per WHMIS all chemicals must be handled safely by trained staff e.g., by wearing appropriate protective gear and taking suitable precautions.

The BC industry is currently developing Best Management Practices for handling spent disinfectants. When complete these will be added in to this document.

Best Management Practices

Disposal of spent disinfectants (in process)

3.12.5.2 Chemicals

Chemicals include but are not limited to fixatives, such as formalin or Davidson's solution used for preserving fish tissues. These chemicals will be stored in clearly marked containers. An MSDS for each chemical that is on site will be kept in a safe, readily accessible place, e.g. binder in the site office. As per WHMIS all chemicals must be handled safely trained staff e.g., by wearing appropriate protective gear and taking suitable precautions.

3.12.5.3 Biologicals

Biologicals include vaccines. Where applicable, these products will be kept refrigerated and handled as per manufacturer's instructions. A product insert for each vaccine that is on site will be kept in a safe, readily accessible place. Trained staff must handle all

biologicals safely e.g., by wearing appropriate protective gear and taking suitable precautions.

4 BROODSTOCK – SPECIAL CONSIDERATIONS

Broodstock may be held at marine/brackish net pen sites or may be held in freshwater facilities. All fish health considerations in the previous sections apply (e.g., biosecurity, routine monitoring, treatments, emergencies, records)[9] though they will differ between saltwater and freshwater sites. For example, water quality monitoring and contingency planning will differ between marine and freshwater broodstock sites.

Objectives differ between private aquaculture facilities and enhancement/conservation facilities as to selection of broodstock, however, most fish health practices are similar. For example DFO captive broodstock are handled in a similar manner to private aquaculture broodstock at marine net pen sites.

4.1 Suitable rearing environment

Management is responsible for providing a suitable, secure rearing environment. Escape prevention is essential.

4.2 Feed and Nutrition

The objective of good nutrition is to keep fish healthy. Broodstock require specially formulated diets to meet their nutritional requirements prior to full maturation. Broodstock feeding strategies differ from those of production fish, particularly as they begin to mature and go off feed. Proper storage of these diets is essential to maintaining their nutritional value.

4.3 Biosecurity

Mature broodstock are kept for a longer period of time than production fish. They may have been exposed to more pathogens or, upon approaching maturation, may have become more susceptible to infection due to the stress of physiological changes they are undergoing.

Where possible separate staff and equipment will be designated for broodstock. Strict disinfection and hygiene procedures need to be in place. In freshwater facilities biosecurity is particularly important to stop the transfer of pathogens from the mature fish to susceptible, young fry.

[9] See Appendix 1 – List of Standard Operating Procedures (SOP's) for a Fish Health Management Plan

As per 2.1 and 3.1 (above) pathogens may be spread by sick fish, through the water, on shared equipment or by inadvertent contact by personnel, visitors or their gear. To minimize two-way transmission of disease, mature broodstock may be kept at a designated site or at a portion of a site or system removed from production fish (saltwater) or hatchery fish (freshwater). Broodstock in freshwater may be kept on a separate water supply.

SOP's

Broodstock biosecurity

4.4 Selection and handling

Broodstock will be handled individually at least once. Aquaculture sites will select broodstock for specific traits, and all sites will sort broodstock by sex and for "ripeness", i.e., whether or not they are fully mature. Handling reasons and methods can vary between private and public facilities but in all cases handling individual fish will be done with care and with minimal stress so as to prevent any problems with gametes (eggs and milt). As per 2.7.2.1 and 3.7.2.4 (above) anesthesia will be done so as to minimize time under anesthetic and to provide as gentle a recovery as possible. FFSBC sites may return broodstock to the lake of origin.

SOP's

Broodstock anesthesia *-Handling, recovery*

SOP's

Broodstock handling

4.5 Treatments

Broodstock will be treated preventatively for specific infectious diseases prior to maturation, particularly those diseases that may be transmitted "vertically", i.e., from parent to egg.

The type and timing of therapeutant treatments required is decided by the Veterinarian and Fish Health Management. As per 2.12 and 3.12 (above) medications will be handled safely with appropriate gear. Treatments will be recorded and withdrawal times and all instructions adhered to.

SOP's

Broodstock treatments

4.6 Egg take

Egg take will be done in as hygienic a manner as possible to prevent horizontal transmission of pathogens to other broodstock or progeny. Adult fish will be anesthetized, gametes harvested, and females destroyed in a humane manner (see 2.7.2.4 and 3.7.2.6 (above)). Males, if used for multiple egg takes, will be monitored for recovery from anesthesia. Proper hygiene and disinfection will be adhered to.

SOP's

Egg take

4.7 Disease screening

The Veterinarian and/or Fish Health Management will develop specific disease screening procedures to minimize the risk of vertical transmission. Samples for disease screening will be collected using proper disinfection procedures

Location of progeny from sampled fish will be kept track of until such time as screening results have been received and reviewed by the Veterinarian and/or Fish Health Management.

For DFO enhanced fish, determining the causes of fish mortality prior to spawning can provide important information on disease incidence in the population and indicate the presence of vertically transmitted diseases.

SOP's

Disease screening procedures

4.8 Egg disinfection

Eggs can be safely disinfected following fertilization and water hardening. This is done at the Broodstock facility and/or when the eggs enter the hatchery (see 3.7.2.1 (above)).

SOP's

Egg disinfection

4.9 Egg (and/or milt) transport

Fish Transplant Permits will be used when eggs and/or milt are transported to the hatchery. Transport will be done in clean, labeled containers with secure lids. Strict disinfection and biosecurity procedures will be adhered to, to prevent transmission of disease from the broodstock site to the hatchery site.

4.10 Identifying progeny

Females will be labeled, and eggs will be clearly labeled by date and appropriately labeled by parents or batch of parents.

4.11 Records

Records will be kept for egg take and broodstock disease screening. Records will accompany each shipment of eggs from the broodstock location to the hatchery receiving the eggs, whether destined for onsite or off site incubation.

5 APPENDICES

5.1 APPENDIX 1: List of Standard Operating Procedures (SOP's) for Fish Health Management Plan

SOP	Marine and/ or Freshwater Net pen sites	Broodstock	Hatchery
Predator Exclusion[10]	X	X	X
Feed storage	X	X	X
Fish handling techniques	X	X[11]	X
Marking fish			X
Water quality monitoring	X	X	X
Water quality equipment calibration and maintenance	X	X	X
Company water quality contingency plan	X DFO Priority Release Plan	X	X DFO Business Resumption Plan
Site and staff disinfection protocols	X	X	X
Visitor protocol	X	X	X
Equipment disinfection	X	X	X
Mortality pick ups			X
Diver disinfection per site	X	X	X
Diver protocols if diving multiple sites	X	X	X
Supplier protocols (general)	X	X	X
Fish transport	X	X	X
Mortality collection and disposal	X	X	X
Mortality classifications	X	X	X
Fish health sampling protocols ○ Proper collection and shipping of samples ○ Lab work (on site, in house, referral)	X	X	X
Anesthesia	X	X	X
Sea lice monitoring (in process)	X	X	X

[10] Private aquaculture facilities should include their Best Management Practices for Escape Management; SOP's are required for enhancement/conservation facilities

[11] See Broodstock handling (next page)

Vaccines handling and storage ○ Dip vaccination ○ Intraperitoneal (IP) vaccination	X	X	X
Euthanasia	X	X	X
Infectious disease emergency protocols	X	X	X
Quarantine	X	X	X
Risk assessment for fish releases	X		X
Medicated feed handling and storage	X	X	X
Administering medicated feed	X	X	X
BMP – disposal of spent disinfectants	X	X	X
Broodstock biosecurity		X	
Broodstock anesthesia ○ Handling ○ Recovery		X	
Broodstock handling		X	
Broodstock treatments		X	
Egg take		X	
Disease screening protocols		X	
Egg disinfection		X	X
Egg (Milt) transport		X	
Egg treatments			X
Alevin treatments			X

5.2 APPENDIX 2: Elements of a Standard Operating Procedure (SOP)

1. Descriptive Title

2. Rationale: An indication of what aspects of the Fish Health Management Plan this SOP addresses (Reference to specific section(s) of this document would be preferred)

3. Definitions: Any technical terms, jargon or abbreviations used in the SOP are defined

4. Authority: Who in the organization is the contact person for any required information on details of the SOP and who is responsible for managing the implementation of the SOP

5. Details of the Operating Procedure:
    a. Goals, targets, legal requirements and/or standards the SOP is striving for
    b. Methods, equipment and procedures use
    c. Frequency of the actions, measures and/or assessment required by the procedure
    d. Who in the organizational structure will be responsible for conducting the SOP
    e. What actions will be taken if the goals, targets or standards are not achieved (response, mitigation, reporting)

6. Records:
    a. What information is recorded to document that the SOP is followed
    b. Where the records are stored
    c. How long the records are stored

The preceding outlines the features of an SOP thought to be necessary to evaluate how the procedure will address the goals and objectives of a Fish Health Management Plan. It is anticipated that the specifics of the SOP will vary with situation, species and rearing objectives. Not all aspects of the above will be required for each SOP. Organizations may have more information than listed above in their existing SOPs.

5.3 APPENDIX 3: Regulations/Policies Directly Related to Fish Health Management

5.3.1 Federal

1. Fisheries Act, RSC 1985, F-14.
- Fishery (General) Regulations, SOR/93-53; Section 56
- Fish Health Protection Regulations, CRC.
- Regulations Amending the Fish Health Protection Regulations, SOR/97-392.

2. Feeds Act, R.S.C, c. F-7, s.1.
- Feeds Regulations, 1983 SOR/83-593.

3. Pest Control Act, RSC, 1985.
- Pest Control Regulations.

4. Health of Animals Act 1990, c21

5. Food and Drugs Act, Revised Statutes 1985 Chapter F27
    - Amended December 2000

5.3.2 Provincial

1. Aquaculture Regulation, B.C. Reg. 364/89.
- Escape Amendments, B.C. Reg.335/00.

2. B.C. Veterinary Medical Association, By-Laws and Code of Ethics, 1999.

3. Fish Protection Act, SBC 1997.

4. Pesticide Control Act, RSBC 1996.
- Pesticide Control Act Regulation, B.C. Reg. 319/81.

5. Pharmacists, Pharmacy Operations, and Drug Scheduling Act, RSBC 1996.
- Veterinary Drug and Medicated Feed Regulation, B.C. Reg. 47/82.

6. Veterinarians Act, RSBC ch.476, 1996.

7. Veterinary Laboratory Act, RSBC ch.477, 1996

8. Waste Management Act, RSBC 1996.
    - Aquaculture Waste Control Regulation, B.C. Reg. 470/88.
    - Land-based Fin Fish Waste Control Regulation, B.C. Reg. 68/94.

5.3.3 Industry Codes of Practice

1. British Columbia Salmon Farmers' Code of Practice